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J. Michael Neary 10/6/04
J. Michael Neary Date

Inventor: Gabrys and Simmons
Serial No.: 09/630,157
Filed: July 31, 2000
Title: "Flywheel Hub-to-Rim Coupling"

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) Group Art Unit: 3682
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) Examiner: Chong H. Kim
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)

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Reply Brief

GROUP 3600

October 6, 2004

Commissioner for Patents
PO Box 1450
Alexandria, VA 22313-1450

Sir:

This Reply Brief is being submitted in furtherance of Applicant's appeal from the final rejection of claims 1-8 and 10-20 in the Final Office Action dated June 7, 2002. It is in response to the Examiner's Answer, which was his answer to Applicants' Appeal Brief filed on Jan. 7, 2003, not Feb. 24, 2004, as stated incorrectly on the cover page of the Examiner's Answer.

- 1) **Real party in interest**
No change from the Appeal Brief.
- 2) **Related Appeals and Interferences**
No change from the Appeal Brief.

3) Status of Claims

Claims 1-8 and 10-20 were rejected in the Final Office Action as noted in summary fashion below. No claims have been allowed.

- A. No change from the Appeal Brief.
- B. No change from the Appeal Brief.
- C. No change from the Appeal Brief.

4) Status of Amendments

On October, 7, 2002, an amendment after final rejection was submitted under Rule 116. An affidavit by co-inventor Dennis Simmons was attached to the R116 amendment to provide evidence, as requested by the Examiner in the Final Office Action, to explain how the disclosure was sufficient to a person of ordinary skill in the art to make and use the invention. The amendment also amended claim 7 to add subject matter from claim 3, which had been rejected only under the §112 rejection, which was explained and (Applicants believe) overcome by the affidavit. Some other claims were also amended, in accordance with the Examiner's suggestions, to correct other informalities and resolve the §112 grounds on which they had been rejected.

On Oct. 30, 2002, the Examiner refused entry of this R116 amendment on the ground that it "raised new issues that would require further consideration and/or search" and did not place the application in better form for consideration and/or search by materially reducing or simplifying the issues for appeal.

On Nov. 7, 2002, Applicants filed a Notice of Appeal and also a Request for Reconsideration of the refusal to admit their R116 amendment, explaining that the added subject matter had already been searched and how the proposed amendment actually greatly simplified the application for consideration of this appeal.

On Dec. 6, 2002, the Examiner's supervisor issued an Advisory Action refusing entry of the R116 amendment on the ground that the previously searched subject matter had not been considered in the context of claim 7.

On Jan 2, 2003, Applicants submitted a Petition under Rule 181 for entry of the Rule 116 amendment. This petition was denied by the Director of PTC 3600 in a Decision dated Jan. 27, 2003, on the ground that the Amendment did not use the same language as the previously claimed subject matter and was broader in scope, and therefore "raised new issues". The Decision on Petition further held that the Affidavit was untimely because it was submitted after a final rejection that did not include a new ground of rejection, even though the Affidavit was submitted at the express invitation of the Examiner in the Final Rejection.

On January 7, 2003, Applicants submitted an Appeal Brief and an Amendment with Appeal Brief to present all the amendments proposed for the §112 rejected claims in the R116 amendment but without the subject matter that the Examiner cited as grounds for refusing entry. Applicants also re-submitted the Simmons affidavit that had been previously submitted with the R116 amendment, since the Examiner had not stated that the Affidavit per se would not be admitted, so Applicants did not know if it had been denied entry along with the R116 amendment.

On March 7, 2003, the Examiner refused entry of Applicants' Amendment with Appeal Brief in an Advisory Action with a check in the 2.C. block indicating that the amendment is not deemed to place the application in better form for appeal by materially reducing or simplifying the issues for appeal, even though no new issues were presented and the amendments were restricted to removing §112 issues. The Examiner did not explain his refusal to enter the Amendment with Appeal Brief, other than the checked box 2.C.

Applicants note that the Examiner did not deny entry of the Simmons Affidavit in the Advisory Action dated March 7, 2003, and the Examiner discussed the Affidavit in detail in his Examiner's Amendment. Accordingly, Applicants assume that the Simmons Affidavit is now of record in this Application.

5) Summary of the Invention

No change from the Appeal Brief.

6) Issues

A. No change from the Appeal Brief.

B. No change from the Appeal Brief.

C. No change from the Appeal Brief.

7) Grouping of Claims

No change from the Appeal Brief.

8) Argument

For simplicity of relating the summary Status of the Claims in §3 and the Statement of Issues in §6 with the related argument in this §8, the same letters used in §§3 and 6 will identify the argument sections.

A) Claims 1-8 and 10-20 have been rejected under 35 USC 112 as containing subject matter which was not described in the specification in such a way as to enable one skilled in the art to which it pertains, or with which it is most nearly connected, to make and/or use the invention.

Claim 1 calls for a flywheel system having a flywheel rim and a concentric flywheel hub with a radially slotted exterior surface facing radially outwards. An annular flywheel rim liner, coaxial with the hub, has an inner surface facing radially inward toward the hub. The inner surface of the rim liner has radial projections that mate with the hub slots to form a torque transmitting coupling therebetween that maintains concentricity between the hub and the rim liner while allowing the rim liner to grow radially with respect to the hub.

The heart of the §112 rejection of claim 1 is reproduced below:

Claims throughout recite the limitation wherein the rim liner grows radially with the rim. This growth is attributed by the specific characteristics of each material the rim and the rim liner utilize. Although the formulas for calculating the numerical values to compare each other are provided, the variables dealing with the characteristics of each material used are not provided in the specification. Without the exact composition of

the material and its values such as modulus of elasticity or the density, making of the invention is very difficult to carry out.

In the paragraph 7 of the Final Office Action, the Examiner invited Applicants to shown that know-how exists, without extensive research by the manufacturing industry, to follow the teachings in the specification to produce the claimed invention. In response, Applicants submitted an Affidavit by co-inventor Dennis Simmons explaining in detail how basic information available from manufacturers of materials or from the open literature is applied, using simple calculations also available in the open literature, to apply the teachings of the specification to make the claimed invention. Applicants were confident that this affidavit resolved the §112 rejection. However the R116 amendment was not entered, nor was the Simmons affidavit even though the grounds for refusing entry had nothing to do with the affidavit.

The Simmons affidavit, with Exhibit A, was resubmitted with the Appeal Brief. The affidavit illustrates and explains the information that is available from suppliers and the open literature about the characteristics of materials used in modern flywheels, and shows how that information is applied in accordance with the teaching in the specification to make the invention. Specifically, the affidavit illustrates an example of the data that is available from suppliers about the materials they sell, and other open literature sources, and shows how that data is used to make the simple calculations to ensure that the rim liner always remains in compressive contact with the rim.

In his Examiner's Answer, the Examiner asserts that the specification fails to teach the material selection process for the rim and rim liner. In particular, the Examiner describes the difficulties that a person of ordinary skill in the art would have in designing a flywheel rim to the required characteristics. In this, the Examiner has entirely misunderstood the invention.

It does not matter to the invention "which composition of E-glass/carbon fiber/epoxy" would be used. In fact, the invention contemplates use of any materials that would produce an adequate flywheel rim. It is not the purpose of this application to teach a person of ordinary skill in the art how to design a flywheel rim; it is assumed that the flywheel rim designer already has that knowledge. Instead, this application teaches the structure and operation of a flywheel rim-to-hub coupling that works with any flywheel rim that the flywheel system designer chooses for his flywheel system.

In the normal process of flywheel design, the engineer would design his flywheel rim to achieve the desired qualities of energy storage capacity, speed, size, temperature limitations, process requirements, cost, etc. that are the typical considerations in designing a flywheel system. In that design process, the flywheel rim-to-hub coupling is not a consideration. It is only after the flywheel rim design has been finished that the engineer would turn to the design of the hub-to-rim coupling. At that point, he knows exactly what the centrifugal growth of the rim will be because he knows exactly what materials he used in the rim, and the growth characteristics can be calculated using data from the material supplier and known analysis techniques based on the characteristics of the materials used in the rim, as explained in the Simmons Affidavit. If the engineer does not want to be bothered making the calculations, he can simply mount his rim on any of a multitude of available hubs, and spin the rim up to the desired maximum speed in a spin pit, taking measurements of the radial growth as the speed increases. Once the growth characteristics of the rim are known, by calculation or measurement, the selection of the rim-to-hub material is easy, as explained in the specification.

The Examiner questions why Applicants "asserted" that the properties of the materials of the flywheel rim are insignificant. Applicants never asserted such a thing. Of course the properties of the materials of the flywheel rim are significant. What Applicants said, in fact is the following:

Applicants believe that the exact composition of E-glass and carbon fiber/epoxy is not needed to make and use the invention since the variables of the various available compositions of these materials differ from each other in ways that are insignificant in the context of the invention, and any variability in these properties is fully accounted for in the expressions that relate the mechanical properties of the materials. The modulus of elasticity and density of the various materials can be ascertained from the manufacturer and applied to the disclosed and claimed expressions to ensure that the flywheel under consideration is within the scope of the invention.

The Examiner also asserts that the "specification fails to further describe in exact term as to what it means by 'strain-to-failure capability' and how one is to derive at the strain-to-failure capability of greater than 4%." Applicants wrote the specification to a person of ordinary skill in the art of designing flywheel systems and considered that rudimentary concepts such as "strain-to-failure" would be well understood by a person of ordinary skill in the art. In simple terms, "strain-to-failure" means the amount

of strain, or deformation, a part can undergo before it fails. Of course, it is always set forth in terms of percentage, since parts of different size would obviously have different absolute deformation elongations before failing, simply because there are different amounts of material in parts of different sizes.

"Strain" is conventionally defined as "the deformation resulting from stress measured by the ratio of the change to the total value to the dimension in which the change occurred". "Failure", also known as the yield point of a material, is the stress at which the material fails. It is indicated in a typical stress/strain curve as the top of the curve where the curve is no longer linear but flattens out to become a permanent deformation and rupture. These definitions can be confirmed in any of a multitude of standard references available to anyone skilled in the art, although the term "strain-to-failure" would never need to be researched by an engineer with the most rudimentary engineering education because it would be so well understood.

B. Claims 7, 8 and 10-20 have been rejected under 35 USC 112, 2nd ¶, as indefinite for failing to particularly point out and distinctly claim the subject matter which Applicants regard as their invention was proper. An attempt was made in the R116 Amendment to correct the insufficient antecedent basis for "said rim" in claim 7, and to delete the terms "maximum speed" and "high speed" in claims 10, 13, 15 and 18, as suggested by the Examiner, to remove the grounds for the §112 rejection of claims 7, 8 and 10-20 based on his opinion that they were "relative terms" and made the claims indefinite. Applicants are submitting herewith an Amendment with Reply Brief to correct these formal problems, since they do not seem to be controversial. Applicants respectfully request that this Amendment with Reply Brief be entered since it is intended to simplify the issues for the Board by removing insignificant matters of a purely formal nature.

C. Claims 7 and 8 were rejected under 35 USC 102 as anticipated by Kundermann. Applicants believe that their non-entered R116 amendment to claim 7 would have removed any question about the patentability of claim 7, that amendment was not entered because it was held to present new issues (the rim liner is inside the rim) and would require further consideration or search.

Claim 7, amended to correct the §112 informalities, calls for a flywheel system having a flywheel hub, a flywheel rim, and a rim liner in compressive contact with the rim. The flywheel hub has radial splines, and flywheel rim liner has radial projections mating with the splines on the hub to form a torque transmitting coupling between the hub and the liner that maintains concentricity between the hub and the rim liner. The flywheel rim liner is made of a material having a strain-to-failure capability and a ratio R_l equal to E_l/ρ_l , wherein E_l is a hoop modulus of elasticity of the rim liner and ρ_l is the density of the rim liner material. The rim liner strain-to-failure capability and ratio R_l are such that the rim liner remains in compressive contact with the rim throughout operation of the flywheel system.

Kundermann teaches a coupling device between a drive shaft and the flywheel mass in the torque converter of an automobile. A series of radial spring fingers on a drive disc attached to the drive shaft have radial teeth that engage slots in a ring on the flywheel. The compliance of the radial spring fingers allows the drive shaft to remain engaged with the flywheel despite perturbations in the torque or vibration between the parts, thereby eliminating chatter.

Kundermann does not mention the problem of differential radial growth due to centrifugal force, and it is not a problem that would ever occur in an automobile because of the low rotational speed in automobile engines.

Kundermann has a flywheel mass 31 which, when one attempts to read claim 7 on it, corresponds to the flywheel rim of claim 7. Kundermann has a "hub" 23 bolted to the drive shaft 1. Now it is necessary to find a "rim liner" in Kundermann that is in compressive contact with the rim and having radial projections mating with the splines on the hub to form a torque transmitting coupling between the hub and the liner to maintain concentricity between the hub and the rim liner, and made of a material having a strain-to-failure capability and a ratio R_l equal to E_l/ρ_l , wherein E_l is a hoop modulus of elasticity of the rim liner and ρ_l is the density of the rim liner material such that the rim liner strain-to-failure capability and ratio R_l maintain the rim liner in compressive contact with the rim throughout operation of the flywheel system. No such rim line exists in Kundermann, so there is no correspondence between Kundermann's disclosure and claim 7.

The Examiner, in his Examiner's Answer, maintains that the element 23 of Kundermann corresponds to the "rim liner" claimed in claim 7, and that the end 3 of the shaft 1 corresponds to the claimed flywheel rim. The Examiner interprets Kundermann's flywheel flange 33 as the "hub", and the holder 25 as part of the flywheel flange 33, which the Examiner calls the "hub".

Applicants admire the Examiner's ingenuity in reading claim 7 on a completely different sort of device, but clever as it is, Applicant believes the attempts does not meet the terms of the claim. Kundermann's "rim liner 23" does not maintain concentricity between the hub and the rim liner, as claim 7 specifies. Concentricity is maintained by the center bearing. Moreover, Kundermann's "rim liner 23" stays in contact with his shaft because it is bolted to the end of the shaft, not because the strain-to-failure capability and ratio R_1 is such to cause that to happen.

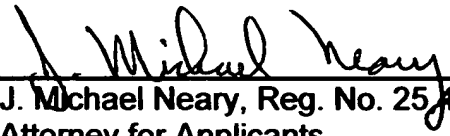
Applicants believe that words do have meaning, even in the Patent and Trademark Office. Applicants believe that it is not appropriate to call an input shaft a "flywheel rim" just so the claim can be rejected. The term "flywheel rim" is understood in the art to mean a rim, the outside part of a flywheel that carries the energy stored in the flywheel. An input shaft would never be considered a "flywheel rim". Applicants do not believe it is appropriate for the Examiner to disregard the functions of elements in a reference in this way just to enable the Examiner to reject the claims. To interpret the input shaft of the reference as the claimed flywheel rim would never occur to a flywheel designer, and certainly did not occur to Applicants until reading the Final Rejection.

Claim 7 should be interpreted to cover a rim liner between a hub and an outside flywheel rim, forming a torque transmitting coupling between the hub and the liner that maintains concentricity between the hub and the rim liner. Applicants attempted to claim the relative positions of rim liner and rim after learning for the first time of the Examiner's interpretation in the Final Rejection, but were not allowed to do so. Certainly, Applicants could have claimed the subject matter of claim 7 in this way when the application was filed, but claim drafting is an inexact science and it is not always possible to get it right the first time.

Thus, Applicant believes that the claims now pending in this application are patentable over the cited prior art and are allowable in their present form. Applicant respectfully requests that the Examiner's final rejection be reversed and that this application be remanded to the Examiner for allowance.

Respectfully submitted,

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Appendix

No changes from Appeal Brief.